

Claims

Sub. a1 [c1] 1. A part marking comprising a first multiplicity of machine-detectable marks arranged in accordance with a two-dimensional redundant bit pattern, said first multiplicity of marks having an appearance to human vision resembling a first character, and said two-dimensional redundant bit pattern comprising a repeating pattern of first and second bit strings forming respective first and second codes identifying said first character and a second character respectively, said second character being different than said first character.

[c2] 2. The part marking as recited in claim 1, further comprising a second multiplicity of machine-detectable marks arranged in accordance with said two-dimensional redundant bit pattern, said second multiplicity of marks having an appearance to human vision resembling said second character.

[c3] 3. The part marking as recited in claim 2, further comprising machine-detectable first and second spatial registration indicators placed such that said first and second multiplicities of machine-detectable marks will be spatially registered when said first and second spatial registration indicators are spatially registered.

[c4] 4. The part marking as recited in claim 1, wherein said machine-detectable marks comprise dots superimposed on an optically contrasting background.

Sub. a2 [c5] 5. The part marking as recited in claim 1, wherein said first and second codes are ASCII codes.

[c6] 6. The part marking as recited in claim 2, further comprising a third multiplicity of machine-detectable marks arranged in accordance with said two-dimensional redundant bit pattern, said third multiplicity of marks having an appearance to human vision resembling a third character, said third character being different than said first and second characters, and said repeating pattern further comprising a third bit string forming a third code identifying said third character.

Sub. a3 [c7] 7. A part marking comprising first and second human-readable characters respectively formed in first and second areas occupied by first and second

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arrays of machine-detectable marks arranged in accordance with a two-dimensional redundant bit pattern, said arrays of machine-detectable marks in said first and second areas respectively having first and second shapes indicative of said first and second human-readable characters respectively, and said two-dimensional redundant bit pattern comprising a repeating pattern of first and second bit strings forming respective first and second codes identifying said first and second human-readable characters respectively, said second human-readable character being different than said first human-readable character.

[c8]

8. The part marking as recited in claim 7, further comprising machine-detectable first and second spatial registration indicators formed in said first and second areas respectively and placed such that said first and second arrays of machine-detectable marks will be spatially registered when said first and second spatial registration indicators are spatially registered.

[c9]

9. The part marking as recited in claim 7, wherein said machine-detectable marks comprise dots superimposed on an optically contrasting background.

[c10]

10. The part marking as recited in claim 7, wherein said first and second codes are ASCII codes.

[c11]

11. The part marking as recited in claim 7, further comprising a third human-readable character formed by a third area occupied by a third array of machine-detectable marks arranged in said two-dimensional redundant bit pattern, said third array of machine-detectable marks having a third shape indicative of said third human-readable character, and said repeating pattern further comprising a third bit string forming a third code identifying said third human-readable character, said third human-readable character being different than said first and second human-readable characters.

[c12]

12. A system for automatic identification of a part, comprising:
a part comprising first and second multiplicities of machine-detectable marks arranged in accordance with a two-dimensional redundant bit pattern, said first and second multiplicities of marks having an appearance to human vision

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resembling first and second characters respectively, and said two-dimensional redundant bit pattern comprising a repeating pattern of first and second bit strings forming respective first and second codes identifying said first and second characters respectively, said second character being different than said first character;

an imager for imaging an area of said part occupied by said marks to produce electrical signals having characteristics which allow discrimination between electrical signals derived from imaging of marks and electrical signals derived from imaging of areas outside of marks; and

a computer programmed to derive said first and second codes from said electrical signals output by said imager.

[c13]

13. The system as recited in claim 12, wherein said computer is programmed to perform the steps of:

digitizing said electrical signals to form first and second bit maps respectively comprising bits corresponding to said first and second multiplicities of machine-detectable marks;

spatially registering said first and second bit maps;

forming a union of said spatially registered bit maps; and

detecting bit strings, corresponding to said first and second codes, in the composite bit map resulting from the union of said spatially registered first and second bit maps.

[c14]

14. The system as recited in claim 13, wherein said part further comprises machine-detectable first and second spatial registration indicators placed such that said first and second multiplicities of machine-detectable marks will be spatially registered when said first and second spatial registration indicators are spatially registered.

[c15]

15. The system as recited in claim 12, wherein said machine-detectable marks comprise dots superimposed on an optically contrasting background.

[c16]

16. The system as recited in claim 12, wherein said first and second codes are ASCII codes.

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[c17]

17. A method of marking parts for automatic identification, comprising the steps of forming first and second human-readable characters respectively in first and second areas on said part by applying first and second arrays of machine-detectable marks arranged in a two-dimensional redundant bit pattern, said first and second arrays of machine-detectable marks respectively having first and second shapes indicative of said first and second human-readable characters respectively, and said two-dimensional redundant bit pattern comprising a repeating pattern of first and second bit strings forming respective first and second codes identifying said first and second human-readable characters respectively, said second human-readable character being different than said first human-readable character.

[c18]

18. A method of automatically identifying parts, comprising the following steps: marking a part with first and second character-shaped arrays of marks; acquiring an image of said part marking; digitizing the acquired image to form first and second bit maps comprising bits corresponding to said first and second character-shaped arrays of marks; spatially registering the first and second bit maps; forming a union of the spatially registered bit maps; and decoding the composite bit map resulting from the union of the spatially registered bit maps to identify the part.

[c19]

19. A system for automatically identifying parts, comprising: a part marked with first and second character-shaped arrays of marks; an imager for acquiring an image of said part marking; and a computer programmed to perform the following steps: digitizing the acquired image to form first and second bit maps comprising bits corresponding to said first and second character-shaped arrays of marks; spatially registering the first and second bit maps; forming a union of the spatially registered bit maps; and decoding the composite bit map resulting from the union of the spatially registered bit maps to identify said part.

[c20]

20. The system as recited in claim 19, wherein said machine-detectable marks

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comprise dots superimposed on an optically contrasting surface of said part.

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